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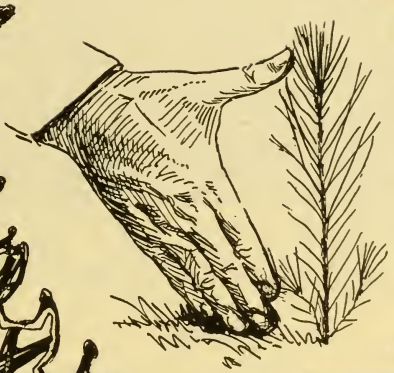

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# PRODUCING PINE NURSERY STOCK IN THE SOUTH

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Southern pine seedlings, especially in the southern Atlantic coastal plain and the Gulf coastal plain, are usually large enough for field planting when 1 year old, and do not need to be held over or transplanted in the nursery as do seedlings in the North and West. Consequently the production of little pines for planting on denuded lands in the South is so simple an operation that it is as profitable an undertaking for the farmer with comparatively few idle acres as it is for the lumber company with large cut-over and denuded areas.[1] In one way, at least, the farmer has the advantage, since he is in a position to give his small forest nursery that individual attention and daily care that will insure the biggest returns and the best stock.

The farmer, too, with only his own demands to satisfy, and with a very small investment in equipment, is in a position to raise a few thousand seedlings of long-leaf, slash, loblolly, or short-leaf pine in years when seed is easy to get, and to abandon his nursery in the years between. This is true also of the other small operators, such as boys' clubs, the scout troop, or consolidated schools. The lumber company, once it has gone beyond the experimental stage in growing seedlings and has increased its annual output to the hundred thousands or millions of little trees, can not so easily accommodate its operations to seasonal trends, but, on the other hand, it is in a better position to disregard these. The full-time services of one or several men will be needed, and there will be the need of establishing a more constant yearly supply of seed than would be possible for the small operator. The complicated problems arising from such large-scale production call for more detailed directions than can be given in this leaflet. In general, however, the larger the operation the more chance there is to reduce the cost per thousand by efficient management.

## Costs

In general, on fairly small operations, the cost of southern pine nursery stock is low; it may be half or less than half of the total cost of planting, which in turn can frequently be kept below $4 or $5 an acre. No more definite figure for these costs can be given, for the items involved themselves vary widely in this respect. Seed may be a few cents or several dollars a pound, and labor may range from almost nothing to $1 or $2 a thousand seedlings. Fencing, bed covers, and similar materials are added items of small but indefinite amount.

[1] See the following publication: WAKELEY, P. C. PLANTING SOUTHERN PINES. U. S. Dept. Agr. Leaflet 32. 1929.

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## Essentials of Success

Good seed, the right kind of seed bed, proper sowing of the seed, plenty of water, careful weeding, and protection from birds and animals are necessary for the production of good nursery stock anywhere. Each of these essentials should be given careful consideration in planning the nursery operation and in the daily care given the seed beds.

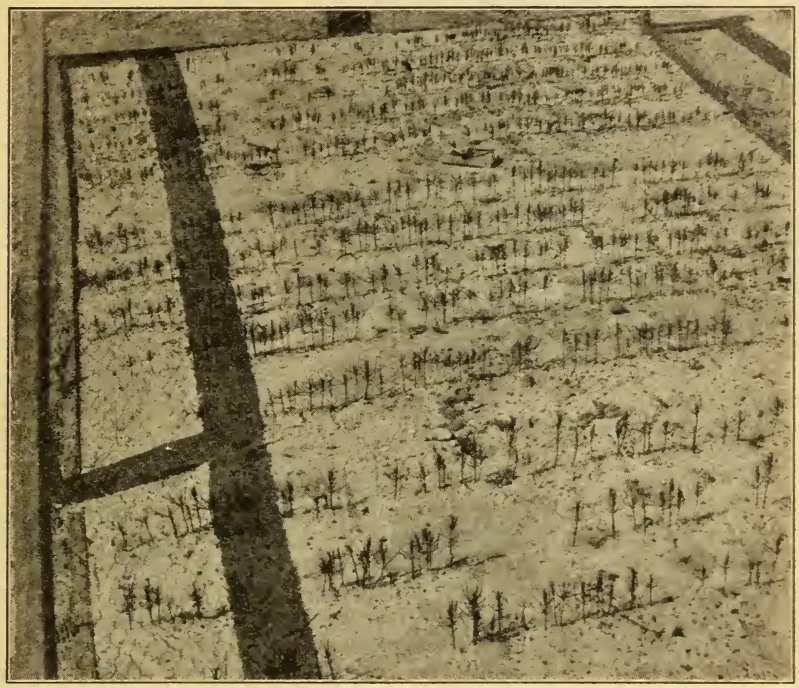

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FIGURE 1.—SLASH, LOBLOLLY, AND SHORT-LEAF PINE SEEDLINGS, 6 WEEKS OLD

These seedlings are just past the age at which greatest loss takes place and overcrowded drills have been properly thinned to 15 to 18 trees to the running foot. Note the protective wire around the bed

## Seed Beds

A seed bed 4 by 12 feet will hold 1,500 to 3,000 seedlings, depending on the species sown. Beds of this size have been found very convenient for small private nurseries. In larger nurseries the beds may be longer or narrower, depending upon the need for cross paths, the length and width of burlap used to cover the beds, the most convenient style of screens or shades, and so on; but beds 4 feet or less in width are the easiest to weed.

Seed beds should be laid out on loamy or sandy soil, rather than on clay soil.

## Protecting the Beds

Before any seed is sown, especially in small nurseries, some provision must always be made for protection from birds; a flock of blackbirds, larks, ricebirds, or doves, or even a few domestic pigeons

can do tremendous damage the first day they discover the beds. In small nurseries it is nearly always necessary to protect the seed beds from birds and mice by fences of half-inch or smaller wire mesh with covers of the same wire on top. (Fig. 1.) The wire should run at least 6 inches into the ground and extend 12 inches above on a framework of sticks and light wood rails. The top covers should be in the form of removable screens small enough for one man to handle easily; 4 by 6 feet is a good size.

## How to Get Good Seed

Fresh seed is essential. Southern pine seed, especially longleaf seed, does not keep well and must be sown not later than the first spring after collection. Good seed may be bought from seed dealers or often obtained from State foresters; but collecting it from trees near the place to be planted is frequently more satisfactory. By collecting his own seed the farmer or lumberman is sure of getting the kind and amount he wants and of avoiding stored seed of poor quality. Furthermore, trees grown from seed collected near the place to be planted usually do better than trees from seed of the same species produced in some other part of the country, where soil and climate may be different.

An abundant seed crop must not be expected every year, and occasionally there will be a total failure of the seed crop of all species over wide areas. Usually, however, some seed is produced somewhere every fall, on open-grown trees if not in dense stands, and enough for ordinary needs can be collected or bought.

Pine seeds are produced between the scales of the pine cones (burrs) and ripen during September and October. Care must be taken to collect the cones before they are too ripe, or the scales will separate and the seeds fall out and blow away. Usually the cones turn slightly dry and brown just before opening. They can be collected from standing trees, or more easily, from trees felled in logging operations. Healthy, thrifty trees should be chosen as the source of seed.

## Seed Extraction

The cones are opened by drying in a layer one cone deep on some smooth surface or on a wire rack with cloth underneath, (fig. 2) in the sun or in a warm, dry room. Drying at ordinary air temperatures takes from a week to a month or more, depending on the kind of cone and on the weather. Seed may also be extracted by drying the cones for 12 or 16 hours in a good lumber dry kiln, at 20 per cent relative humidity and temperatures not in excess of 120° F. Higher temperatures may injure the seed. Kiln extraction saves time and may prevent serious insect damage to the seeds still in the cones.

A bushel of sound, ripe cones of any of the southern pines should yield a pound or a pound and a half of seed, which is removed by stirring or tumbling the cones in a box or on a screen.

When thoroughly dry the seed can safely be stored for six or eight months in sacks, boxes, glass jars, or tin cans. Care must

be taken to keep it from mice. Seed the least bit moist spoils quickly in a closed container.

The seeds of all the southern pines have wings. The wings of long-leaf are hard to remove, but those of the other species are easily cleaned off by rubbing the seed between the hands and winnowing it in the wind or before an electric fan. Cleaned seed is easier to sow.

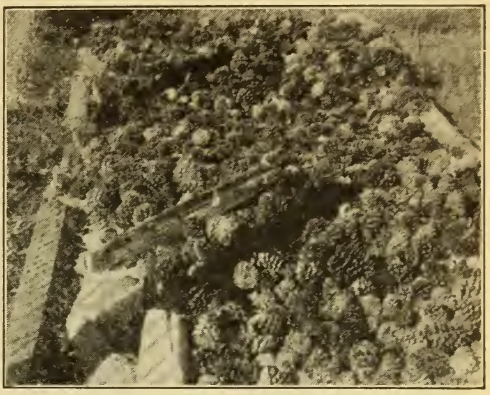

FIGURE 2.—OPENING LOBLOLLY PINE CONES IN THE SUN

On wire and burlap racks, a few inches from the ground, they are kept dry at night and during wet weather by a canvas cover

### Preparing and Sowing Beds

The soil in the beds must be spaded thoroughly and raked smooth and level before sowing. It is best to prepare the beds a month or more before sowing, to give the soil a chance to settle. A final raking just before the seed is put in will then level any uneven places and give a fresh surface for the seed.

Early spring sowing seems to be more generally satisfactory than fall sowing. Seed may be put in early in March in the southernmost States and progressively later toward the north. It may be broadcast evenly all over the bed or sown in drills about 6 inches apart. The broadcasting makes better use of the soil and is quicker except where some sort of drill-sowing planter or seeding trough can be developed (fig. 3); the drills make weeding easier later on. The seed should never be covered more than one-eighth to one-fourth of an inch deep with sand or soil and may more easily be covered with a single layer of burlap sacking instead of soil. A light layer of loblolly pine needles (pine straw) has also worked well in some nurseries. The bed must be well watered immediately after sowing. Great care must be taken to remove the burlap or pine straw as soon as the seed has sprouted well.

### Proper Spacing of Seedlings

Long-leaf seedlings should not stand closer than 30 or 40 to the square foot in a broadcast bed, or 10 to the running foot of drill. The corresponding numbers for slash and loblolly are 50 to 60 to the square foot broadcast and 15 to the running foot in drills; for shortleaf, 70 broadcast and 18 in drills. Seedlings surviving the first six weeks or so in greater numbers than these must be thinned to the proper density; otherwise slow growth and injury or occasional deaths will result. (Fig. 4.) Thinnings should not be made until seedlings are at least 6 weeks old and past the stage at which the greatest loss generally occurs. It is quicker and safer to cut the surplus seedlings off with scissors than to pull them.

## Amount of Seed to Sow

Long-leaf pine seeds, with the wings on, usually run about 5,000 to the pound; the cleaned seeds of slash pine run about 15,000 to the pound; those of loblolly, about 20,000; and those of short-leaf, about 50,000.

In small nurseries the quantity of seed to be sown can be judged closely enough by eye or can be determined approximately from the figures given above, counting on about half of the seeds to produce trees.

In a large nursery it always pays to sprout several counted samples of the seed a month or six weeks before sowing, to find out just what percentage is good. If several different lots of seed are to be sown in the nursery, several samples of each should be tested. The

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FIGURE 3.—SOWING LONG-LEAF SEED IN DRILLS WITH A SEEDING TROUGH

A supply of seed is carried in buckets and measured out in small cups. When the handles are pushed together the bottom of the trough opens and drops the seed into a shallow trench made by the weight of the trough

testing should be done in sand boxes or in the nursery itself, under conditions as nearly as possible like those existing in the regular nursery beds. If the percentage of good seed so determined be divided into the number of trees per bed that are desired, and this number be increased by a reasonable allowance for loss of seedlings during the early stages, it will only be necessary to divide the result by the number of seeds per pound (determined by counting small samples) to arrive at the weight measure of seeds per bed that must be sown.

## Watering and Shading

Pine seed beds must be kept well watered. Ordinarily rains will be sufficient, but in dry spells during the spring and summer a 4 by 12 foot bed, especially if it shows any signs of suffering from drought, should have four or five pails of water poured or sprinkled on it very carefully every few days. If enough water is not available, the bed may be shaded with strips of lath tacked an inch or two apart on a wooden frame a foot to a foot and a half above the bed.

The strips of lath should run north and south, to make their shadows move rapidly with the sun. Such shade should be left off in wet or cloudy weather, and it should not be used after early July. Too much shade makes seedlings weak and spindling and increases the loss from damping off. Southern pines, except possibly short-leaf, need no shade at all if properly watered.

The establishment of a large nursery should not be undertaken without making provision for watering, at least in the form of irrigation in the paths. Sprinkling with a hose, with small automatic sprinklers, or with an overhead system covering the whole nursery, is better than irrigation.

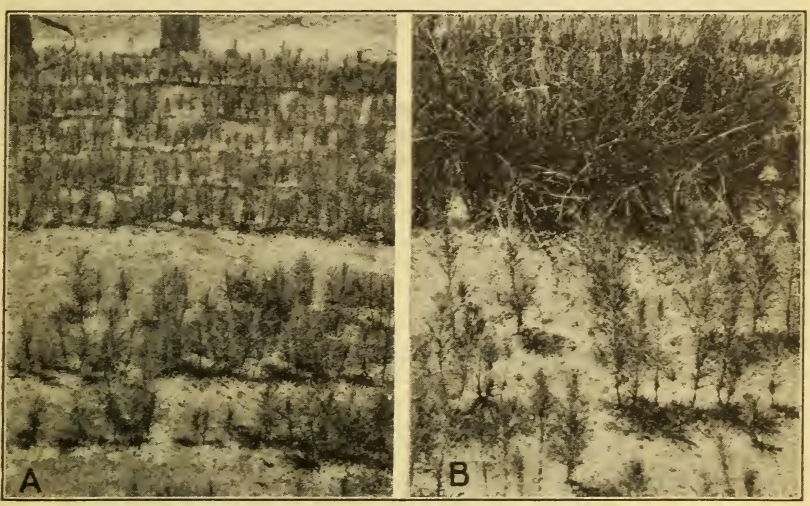


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FIGURE 4.—FOUR MONTHS OLD AND PROPERLY THINNED

Seedlings are: A, (foreground) loblolly and (background) short-leaf pine; B, (foreground) slash pine and (background) long-leaf. Note the characteristic long leaf and absence of stem of the long-leaf seedlings

## Weeding

Seed beds must be kept weeded. This is usually done by hand. The smaller the weeds when pulled, the better for the seedlings and the easier in the long run is the task of keeping the beds clean. Narrow beds, 4 feet or less in width, are easier to weed than wide beds. Drill sowing makes weeding easier because most of the weeds can be hoed out between the drills. There is also a possibility, especially in large nurseries, of controlling weeds by the use of inexpensive chemicals.

## Injuries to Seedlings

Of the various injuries affecting pine nursery stock, damping off is usually the most serious and often the most difficult to control. This is a disease which may kill seedlings at any stage from the time the seeds first sprout until vigorous growth is under way and larger needles develop above the original "seed leaves," usually a month or two later. The disease is most dangerous in wet weather and long-leaf pine is especially apt to suffer. The seedlings discolor and

wilt suddenly, or simply fall over, and on examination the roots are found to be watery or brownish and often actually rotting away. When the disease is discovered, watering should be stopped and all shade removed. Prompt sprinkling of the bed with an eighth of an inch of pure sand has sometimes checked the trouble. Damping off, like weeds, may sometimes be most economically controlled in large nurseries by chemical treatment.

Injuries by heat and drought are usually easily recognized, especially since they come during dry, hot weather after danger of damping off is past. Growth is poor, seedlings become yellowish and finally turn brown and die, and in the worst cases of heat injury actual scars on the tender stems at the surface of the ground cause the seedlings to fall over. The remedies are increased water and partial shade. Except in the worst cases, heat and drought injuries develop less suddenly than damping off.

Insects are an added though not always serious source of danger to pine seedlings. The hardest to control are white grubs, which eat off the roots underground and cause the seedlings to turn reddish brown and die. All such grubs found when spading the beds, at least in small nurseries, should be picked out and killed. Other insects, which sometimes eat the leaves or attack other parts of the plant, can generally be controlled by using any of the ordinary insect sprays according to the directions on the package, or by spreading poisoned bait. Specific information on the insects that injure pine seedlings can be obtained from the Bureau of Entomology, Washington, D. C.

No special treatment or treatments in any nursery can take the place of watchful, daily care by some one of ordinary judgment and common sense. The important thing is to catch trouble at the start and correct conditions before serious loss occurs.

## Further Information

Further information regarding nursery practice can be obtained by addressing the Southern Forest Experiment Station, New Orleans, La., the United States Forest Service, Washington, D. C., or your State forester. Most States have also an extension forester, who can be addressed in care of the State agricultural college. Addresses of State foresters, or those acting in a similar capacity, are as follows:

Alabama: Page S. Bunker, State forester, Montgomery, Ala.
Arkansas: W. K. Williams, jr., extension forester, 310 Federal Bank and Trust Building, Little Rock, Ark.
Florida: Harry Lee Baker, State forester, Tallahassee, Fla.
Georgia: B. M. Lufburrow, State forester, State Capitol, Atlanta, Ga.
Louisiana: W. R. B. Hine, superintendent of forestry, department of conservation, New Orleans, La.
Maryland: F. W. Besley, State forester, 1411 Fidelity Building, Baltimore, Md.
Mississippi: Roy L. Hogue, State forester, Jackson, Miss.
North Carolina: J. S. Holmes, State forester, Raleigh, N. C.
Oklahoma: George R. Phillips, Secretary, Oklahoma Forest Commission, Oklahoma City, Okla.
South Carolina: Lewis E. Staley, State forester, Columbia, S. C.
Tennessee: R. S. Maddox, State forester, Nashville, Tenn.
Texas: E. O. Siecke, Director, Texas Forest Service, College Station, Tex.
Virginia: Chapin Jones, State forester, University, Va.

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